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ANNUAL REPORT

On the Memorandum of Understanding among the Four Natural Resources Departments on Science and Technology for Sustainable Development

The second annual report on the work accomplished by the four natural resources departments under the Memorandum of Understanding on science and technology for sustainable development is submitted by

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Executive Summary

The momentum continues to increase in the Memorandum of Understanding (MOU) among the four federal natural resources departments. More issues of common concern have been identified, and new working groups are immersed in results-oriented work plans, many of which will help in the formation of future policy. Horizontal issues are becoming more and more evident among the members of the MOU. As these issues involve other departments, the MOU becomes the catalyst for linking into the issues of the day and the issues of the future.

Work is already under way to extend the MOU for a further three years. The six original working groups have produced substantial reports while forging partnerships and building bridges with other departments. There have also been links to other federal initiatives including biotechnology, northern science, the implementation of Canada's new federal science and technology (S&T) strategy, and increased mobility of staff under the "Framework for the Human Resources Management of the Federal Science and Technology Community".

Acting as a focal point for the integration of programs across departments, the MOU responds to the constraints of Program Review and shrinking resources. It has already begun to address the future needs of integrating socioeconomic indicators with science, addressing emerging health issues that are of growing concern to many Canadians, coordinating S&T activities at the regional level, and updating the management of data and information in this new era of communications. To that end, new working groups were established to address the following issues: valuing natural capital and sustainable development indicators; the environmental effects of endocrine-modulating substances; the pilot for a regional MOU in the Atlantic provinces; and the use and value of information technology and technology management strategies. Two new groups have been added for 1997–98 to focus on nutrients in the Canadian environment and state of the environment reporting.

Among the accomplishments of the working groups in the second year of the MOU are the following:

- Scientists in Canada's four natural resources departments continue their international role as an important resource in research to answer some of the scientific uncertainties surrounding climate change. The working group on climate change and variability has issued "The State of the Science of Climate Change", a document that gives the federal government a common voice on science, research, and related Canadian priorities.
- As a way to ensure that federal government S&T is as effective as possible, the Scientific Mobility

Exchange Program pilot was set up as an assignment-based program aimed at enhancing the interdepartmental mobility of the S&T community through exchanges of personnel.

- The working group on the environmental effects of endocrine-modulating substances is establishing information needs, identifying knowledge gaps, and doing further work on an assessment of the effects of endocrine modulators on aquatic ecosystems.
- Work progresses on the pilot project to form regional MOU relationships in the Atlantic region. Examples include long-term monitoring activity research and bringing together scientists and community group representatives to address issues in the southern Gulf of St. Lawrence.
- A Web site is "up" to facilitate access to information, develop and demonstrate joint Internet applications, and communicate more effectively with the public.
- Joint field work commenced on measuring mercury releases to the atmosphere from natural sources and obtained encouraging results. Significant progress was made in establishing an industry–university–government metals in the environment research network. Work on mercury deposition network sites across Canada continues in 1997.
- A major report summarizing current federal research on UV-B impacts showed the range of research under way in Canada into the effects of present and artificially enhanced levels of UV-B radiation on both natural and managed ecosystems. Results include many disturbing potential ecosystem effects at present UV-B levels; impacts were observed on crops, trees, freshwater ecosystems and valued marine species.

With the working groups as its backbone, the MOU is now moving toward a more strategic approach to address issues. Getting working groups up and running is no longer the main focus; it is now program-oriented, with a stronger, more focused network approach to issues across government.

Introduction

Natural resources are part of Canada's identity and key components of its economy. With the goal of wise use and sustainable management to help maintain economic growth comes the understanding that success also requires coordinated effort and teamwork among departments, with stakeholders, and across sectors. This understanding was firmly in mind when a Memorandum of Understanding (MOU) was signed among the four federal departments that deal with natural resources: Agriculture and Agri-Food Canada, Environment Canada, Fisheries and Oceans Canada, and Natural Resources Canada.

Maintaining the course toward sustainable development takes on an added challenge with Program Review, as federal organizations rethink priorities, strategies, and the way they do business. Doing the same with less, or doing more with less, means finding innovative ways to work together for common goals. This is a significant factor driving the success of the MOU as it reaches out to other departments and agencies to help address issues and forge partnerships. For instance, Health Canada has become a member of the new working group on endocrine disruptors. Another part of the MOU foundation, the federal science and technology (S&T) strategy, is evident in activities to date as departments are working together on priority S&T issues.

The main strength of the MOU is its ability to bring signatory departments together to address issues of common concern that are either current or beginning to emerge. The six original working groups have produced substantial reports, forged partnerships among the four departments and built bridges with other departments. With the success of this approach, other new working groups have been added to deal with a broad range of science and science management issues, ranging from ways to value natural capital to establishing the environmental effects of endocrine-modulating substances. The value of the MOU can also be seen through links to other federal initiatives such as biotechnology, northern science, the implementation of Canada's new federal S&T strategy, and increased mobility of staff under the "Framework for the Human Resources Management of the Federal Science and Technology Community".

The future is firmly in mind for the MOU's third year. Those involved are making sure it matches the reality of today's federal government while they also look to the future. There is a clear recognition that the success of the first two years provides a solid basis for meeting some of the new challenges of the future:

- to integrate socioeconomic indicators with science;
- to address emerging health issues of concern to Canadians;

- to facilitate better integration at the regional level across all natural resources departments; and
- to update data management and information exchange in the new era of communications.

The MOU has proven to be an effective coordinating tool in its first two years, and it is expected to work well in meeting future challenges.

Background

Signed by the four deputy ministers on January 18, 1995, the MOU represents an agreement to encourage collaboration and coordination in the use of S&T for sustainable development. Over the last two years, the four departments have been implementing a framework for sustainable development S&T in the natural resources sector and increasing cooperation on specific projects within a series of working groups.

In 1995–96, the first five working groups were established to address research and development (R&D) priority setting, renewable energy technologies, metals in the environment, climate change and variability, and coastal zone management. A sixth group was added during the first year to focus on the ecosystem effects of UV-B radiation. In 1996–97, four new working groups and a special project were established:

- The working group on natural capital and sustainable development indicators is working to meet the need to further integrate socioeconomic indicators with science.
- The working group on the environmental effects of endocrine-modulating substances is addressing an important emerging health issue of concern to Canadians.
- In an attempt to bring the concept of the four natural resources departments to the regional level, a pilot project is under way in the Atlantic region. If successful, it may be expanded to other regions.
- The use of the Internet is being explored as a key tool in the modern management of sustainable development issues.
- A special project was also launched during the year under best practices issues to increase the mobility of scientific personnel within the federal government.

As an indication of the ability of the MOU to respond quickly to emerging issues, two more working groups were added for 1997–98:

- The working group on nutrients in the Canadian environment will look at nutrients from human activity and how they affect aquatic and terrestrial environments.
- The working group on state of the environment reporting will focus on developing ways to get reliable, solid, and accessible information that links environmental, economic, social, and health factors.

Work is conducted under the MOU through committees: the Assistant Deputy Ministers (ADM) Steering Committee, consisting of assistant deputy ministers from the four departments, and the Directors General (DG) Committee. Reporting to the DG Committee are the various working groups established under the MOU.

A complete list of participants is found in the annex.

Looking to the Future

Moving Forward

The MOU has shown itself to be a catalyst in moving forward with the sustainable development agenda, and planning is well under way to move Canada into the next century. As the MOU moves through the last of its three-year phase, work also continues through the 1997–98 fiscal year on an extension to the MOU.

Some invaluable guiding principles have emerged from the experience of the first two years of the MOU. Continued success depends on

- achieving tangible results;
- clearly establishing itself as *the* way for delivering on pertinent topics for all work undertaken;
- involving activities of scientific and strategic interest to all departments, *but* each department need not have an active research or management role in each scientific topic;
- expanding the MOU to include key players as issues emerge (e.g., Health Canada);
- being considered as an appropriate vehicle for proactive work on other government priorities while recognizing that the MOU will be primarily concerned with horizontal issues related to science for sustainable development.

As planning proceeds for the future, the ADM Steering Committee has the advantage of looking back on a record of considerable success. The original working groups are completing their work and producing substantial reports. More important, they are establishing new ways of working together and thinking about issues. Success has also meant the establishment of additional working groups. They are good examples of the response to new management issues, new areas of scientific concern, attempts to broaden the base of the MOU from headquarters to regions, and innovative ways to use new tools.

In keeping with meeting new challenges and horizontal issues, it is expected the new 1997–98 working groups under the MOU umbrella will become more fully developed. The working group on nutrients in the Canadian environment will help gather important information on the nutrients entering the environment through human activity and determine whether they interfere with or degrade aquatic and terrestrial ecosystems. The working group on state of the environment reporting will help provide the focused and timely information needed for decision making.

Major Issues

As planning continues for the future of the MOU, it is anticipated that work will centre on three major issue areas:

1. Science/Policy Issues
By emphasizing specific sustainable development issues of

interdepartmental interest, there will be more synergy for reaching an understanding, especially for issues that affect national policy. As some or all of the four departments have to report periodically on water, air, and biodiversity, working groups may be established to address such issues. In other cases, new policy dimensions may be added to the work of current groups, such as those working on metals in the environment and climate change. Specific issues being considered for the immediate future include the following:

- Examining the role of science in establishing policies relating to sustainable development, since "sound science is central to sound policy and decision making".
- Developing the general principles for establishing the basis for a solid foundation of knowledge on issues such as soil, water, and air. This would allow for meeting a major future challenge, that of integrating insights from the social sciences into our work on sustainable development.
- Providing guidance on how future regional working groups should be organized and operated to function effectively in meeting the MOU objectives, based on experience gained from the Atlantic pilot, which is due for review in the fall of 1997.
- Using working groups as tools to allow the MOU to become the vehicle for government-wide strategic approaches on issues.

2. Issues Related to the Federal S&T Strategy

The MOU provides a vehicle to promote cooperation among the four departments in implementing the federal S&T strategy.

- Performance measurement. The ADM Steering Committee will share experiences and the principles underlying the measurement of performance in each of the four departments, with respect to sustainable development.
- Promotion of international S&T collaboration for the benefit of Canadian firms. The four departments will share best practices and make recommendations on the best approach to promote international S&T collaboration for the benefit of Canadian firms, including such options as membership in the international activities that can provide the greatest return to Canada through science, technology, and investment.
- Promotion of partnership and collaborative S&T arrangements. This is another area of interest to each of the four departments. Experience in

the results obtained from providing access for universities to research facilities and in providing "small grant" support to research will be shared in an attempt to best address the objectives of the S&T strategy. Areas in which the provinces are expending significant scientific effort related to sustainable development will be sought out as a focus for increasing federal–provincial interaction.

3. Management Issues

The ADM Steering Committee and the DG Committee intend to share and implement best practices related to the management of S&T. Communicating the value of science related to sustainable development also represents another opportunity in which departments can learn from each other. Environment Canada's production of a series of science vignettes in conjunction with the Discovery Channel provides a valuable model for future work. Sponsorship of such public education materials could be among the joint opportunities for the four departments to pursue in coming years.

With an expanded vision that includes association with other departments, it is anticipated that new partners, such as Health Canada, will be involved in MOU activities where appropriate. This move would help deal more effectively with integrating programs and issues, as now exists only in certain working groups. Provincial activity and potential input will be taken into account in addressing common challenges with these new partners. The proximity of the laboratories of different departments in some regions may facilitate reciprocity and sharing of services with each other, and with provincial counterparts.

New Directions: New Working Groups

Among MOU successes are the ability to link issues among departments and efforts to make the best possible use of existing resources. There is a high level of interest in the MOU work from departments that do not have a natural resource base, but do have horizontal issues. The flexibility to expand to meet both current and future challenges allows the MOU to quickly respond to emerging issues.

Valuing Natural Capital and Sustainable Development Indicators

Objectives: To provide a Canadian perspective on the work being conducted by the World Bank and other international agencies on the value of natural capital and, where possible, to develop socioeconomic indicators of sustainability for Canada.

Issue and Initial Steps: In 1995, the World Bank reviewed the performance of 192 countries on the basis of a new accounting system to determine the wealth of nations. This approach advanced the Brundtland Commission's definition of sustainable development by treating the concept of sustainability as a kind of opportunity. The argument is that wealth provided to future generations through various forms of capital provides an indicator of this opportunity. Natural capital was defined as the stock of environmental assets such as soil, atmosphere, forests, water, and wetlands.

However, the World Bank calculations are only approximations, and better estimates are needed of the inherent value of land, water, and air, of marine and other ecosystems, and of the various interdependent species and genetic resources.

Created to provide a Canadian perspective on work done by the World Bank and other international organizations with regard to valuing natural capital, this working group will also develop economic sustainability indicators to complement existing biological and physical indicators. These indicators could help further define sustainable development, allowing us to determine the legacy of our environmental assets for future generations.

Work Plan: The working group plans to examine the value of water as the first step in its long-term work plan. Work undertaken by the World Bank will be analyzed and ways of applying it to the Canadian situation will be examined. There may also be opportunities for further cooperation with the World Bank, which has communicated an interest in working with Canada to develop a case study

on natural capital for possible inclusion in the next edition of "Monitoring Environmental Progress" (expected in two years).

Expected Results: Identification and examination of specific components of natural capital; a possible collaboration with the World Bank and one or more developing countries in order to address the gaps in our knowledge of natural capital.

Long-term results could include influencing the World Bank's approach for estimating natural capital in future studies and developing a better understanding of natural capital as a sustainable development indicator in Canada.

Environmental Effects of Endocrine-Modulating Substances

Objectives: To review the endocrine effects programs of the four departments; identify information needs and knowledge gaps critical to the development of Canadian policy; and recommend an interdepartmental scientific policy to address these needs and gaps.

Issue and Initial Steps: There is substantial evidence that endocrine changes are occurring in wildlife species exposed to chemicals in the environment. The study of endocrine-disrupting compounds has focused on reproduction (including sex ratios), reproductive success, recruitment, time/age to sexual maturity, condition factors, and hormone/receptor concentrations; development and growth; and immuno-competence as measured by immune challenge assays.

Public interest in the impacts of endocrine-disrupting compounds (EDC) has been raised by more scientific evidence and by the World Wildlife Fund-sponsored book* Our Stolen Future *(released in March 1996). Canadian research has figured prominently, and new research is being developed worldwide. At the same time, the problem of defining EDC-related effects continues to grow. A more formalized interdepartmental communication structure would lead to clearer communication pathways in this rapidly developing field.

The issue is still being defined, and a methodology would help coordinate the evaluation of scientific and public concerns while determining Canada's position in international fora. This working group includes Health Canada and will focus on the science of the impacts of endocrine-modulating substances on aquatic organisms, fish, and wildlife. It will review relevant government programs and interdepartmental linkages to

determine opportunities for collaboration and to identify and recommend key issues for priority attention by individual or combined departments.

Work Plan: Two tasks have been established.

The first task is to review the endocrine effects programs of the participating departments, establishing information needs and knowledge gaps critical to the development of Canadian policy. Activities in 1997 include a document on relevant endocrine effects, programs, and knowledge; a scientific workshop on endocrine effects; an assessment of the effects of endocrine modulators on aquatic ecosystems; and an assessment of the state of the knowledge and Canadian research needs.

The second task is to recommend an interdepartmental scientific program to address the needs and gaps identified.

The United Nations Environment Program and the United States are coordinating an international inventory of projects to facilitate cooperation and reduce funding duplication. The informal inventory of Environment Canada will be expanded through the working group to include other departments and become incorporated into the international inventory. Research plan development on Canada's initiatives is necessary to address critical information needs. Also necessary is the development of an implementation plan incorporating the expertise of the natural resources departments, universities, and the private sector.

Expected Results: A review and assessment of existing knowledge and Canadian scientific programs (specific reference to the uniqueness of Canadian ecosystems and related socioeconomics); the design for an effective Canadian research program, along with an implementation plan. It is anticipated that this will be ready for review by February 1998.

Atlantic Regional Pilot

Objective: To examine the feasibility of regional equivalents of the MOU and to prepare an action plan.

Issue and Initial Steps: The working group is looking for ways the MOU might be adapted to circumstances at the regional level.

There has been an exchange of information and documentation on projects where there are collaborative efforts. A regional conference on climate change held in December 1996 served to highlight partnership opportunities and led to a climate change report that has now fed into the Canada Country Study.

Dubbed the Federal Natural Resources Departments Atlantic Pilot Project, this process involves taking the MOU to the regional level. It is focused on the maritime provinces and includes Fisheries and Oceans Canada, the Canadian Forest Service, the Geological Survey of Canada, Agriculture and Agri-Food Canada, and Parks Canada. Environment Canada has chaired the group and provided secretariat functions. It is still too early to determine the success or failure of the pilot project, but the process has provided an arena for useful dialogue and established opportunities for collaboration.

Work Plan: The 1997–98 work plan includes the synthesis of departmental work plans related to the Bay of Fundy.

Summaries of current and planned programs and specific research activities have been collated, and a preliminary evaluation has been completed. The final report will include information that had not originally been captured, acknowledgment that certain gaps are the result of funding pressures, and reference to what program linkages should also be made. The report will serve as a stepping stone for future work in the Bay of Fundy.

A working group on long-term monitoring has been struck to examine opportunities for coordination and collaboration in the context of long-term monitoring and to summarize activities in an approach similar to that in the Bay of Fundy document. A catalogue may be developed to demonstrate outstanding collaboration among the four departments. Finally, a workshop to be held in November 1997 under the sponsorship of the four departments will bring together scientists and community group representatives to address issues in the southern Gulf of St. Lawrence.

The Internet provides an unprecedented opportunity for communicating the importance of sustainable development issues to both internal and external audiences.

Expected Results: The initial focus is to make scientific progress on a number of joint initiatives, such as ecosystem-wide changes in the Bay of Fundy, long-term ecological monitoring, and delivery of a regional climate change conference.

The Internet

Objective: To demonstrate the use and value of information technology and information management strategies as the four departments increase awareness and support of sustainable development issues.

Issue and Initial Steps: Used to its full advantage and in an efficient manner, the Internet is an effective tool in the management of information inside the federal government and with the public. A Web site was created to facilitate access to information, to develop and demonstrate joint Internet applications, and to communicate more effectively with the public. In March 1997 a report was completed on the status of Internet activities in each department.

Work Plan: Goals include identifying existing and emerging networks of expertise, program development, and information sharing related to environmental, natural resource, and sustainable development issues, including those using the Internet as a communications integration and distribution tool.

Department experts will investigate and compare experience in using the Internet effectively and make recommendations at a conference to be held in December 1997.

Expected Results: Exploration of the four departments' current and future use of the Internet in doing business and communicating S&T to the public. The working group established three key objectives for the program: review the current Internet activities and practices of the four departments; use the Internet to demonstrate the benefits of collaboration in the areas of internal and public communication; and develop a common vision of what the Internet means to the four departments now and in the future.

SCIENTIFIC MOBILITY EXCHANGE PROGRAM PILOT

Objective: To increase the movement of scientific personnel within the scientific community through assignments.

Issue and Initial Steps: There is no single federal human resources policy or strategy, but rather a complex web of government-wide and departmental policies and practices covering the scientific and technical expertise employed by the federal government. The core issue was finding the best way to remove barriers to effective federal scientific and technical activities.

In March 1996, the federal government released its "Framework for the Human Resources Management of the Federal Science and Technology Community", supported by five interdepartmental working groups, including one dealing with workforce and mobility. One part of the implementation process was testing a practical collection of strategies, pilot projects, and administrative changes. In August 1996, a pilot project proposed by the working group on workforce and mobility was approved by the senior steering committee for the human resources management of the S&T community.

Assignment-based, the pilot is aimed at enhancing interdepartmental mobility of the S&T community through exchanges of personnel and responds to some of the Auditor General's observations. Managers within the four departments are encouraged to identify assignment opportunities and candidates to fill them. These assignments are open to all S&T personnel, including research scientists and managers, all science groups (BI, CH, RES, PC, CO, CS, etc.), science policy analysts, engineers, and technicians supporting scientific research. Designated group members (women, Aboriginal peoples, persons with a disability, and visible minorities) are especially encouraged to apply. It is anticipated the pilot will be expanded to include all science-based departments and, if successful, could become a permanent program for the S&T community.

The federal government is fortunate to have significant scientific and technical expertise in its workforce. It is important that human resources policies and practices do not put up barriers to making sure science and technology activities are carried out in the most effective way possible. This pilot was designed to operate as a special project under the MOU.

The Scientific Mobility Exchange Program pilot has been relocated to the Public Service Commission under the Interchange/Career Assignment Program Directorate.

To date:

- Over 450 inquires have been received from S&T employees; 20 assignment opportunities were received in various parts of the country, including one from the new Canadian Food Inspection Agency. Eight of the 20 have been filled, five of which were interdepartmental. Seven of the eight candidates are from the four designated groups.
- Participation is being explored with Health Canada and National Defence.
- An S&T Web site developed by Treasury Board Secretariat includes a page for the program. It will have direct assignment submission and confirmation forms, putting the process completely on-line.

Reports from the Existing Working Groups

Climate Change and Variability

Objective: To foster collaboration and joint planning to address research priorities in Canada in the areas of climate change and variability.

Expected Results: Statements on what is known about climate variability and change; identification of gaps and priorities for future research in the four departments; a plan for achieving research goals; improved communication of climate change information; and increased awareness of S&T activities.

1996 Achievements: Common documents give the departments a common voice and improve communication with the public. "The State of the Science of Climate Change" was completed in 1996, to be made available on the Natural Resources Canada Web site. This document brought together, for the first time, a common understanding of the state of the science of climate change. Issues addressed include projected levels of increase in greenhouse gases over the next century; the cooling effect caused by high atmospheric concentrations of tropospheric aerosols; changes in global mean temperatures over the past 100 years; evidence that human activity is having an impact on global climate; possible changes in future climate based on a range of emissions scenarios; and the uncertainties of and need for future scientific work.

As world governments debate the next steps needed to deal with climate change, there is a constant challenge to reduce the scientific uncertainties surrounding the issue. Canadian scientists in the four departments, many of them world-renowned experts, continue to be an important international resource in answering these questions. The working group on climate change and variability seeks to focus research on gaps in our knowledge on projecting and detecting future climate change.

Planning began for a science forum on climate change and variability, which would bring together key scientists and research managers from the four departments to discuss the Intergovernmental Panel on Climate Change (IPCC) priorities for improving our ability to project and detect future climate change, the related Canadian priorities, and the ways Canadian research programs can make a contribution.

Work is under way to provide enhanced climate change information on the Internet. This information is currently scattered through the

four departmental Web sites. The creation of a common gateway to climate change information will make it easier for the public to find information and provide a better vehicle for departments to get their messages across to the public.

Next Steps: A second document, based on the findings of the Canada Country Study, summarizes the potential impacts of climate change in Canada and is expected to set a standard for statements by the four departments about these impacts.

The working group will host a science forum in January 1998, followed by a report, to address priorities and gaps in climate change science in Canada. There will also be a review of the gaps and priorities identified in the Canada Country Study. This will identify areas for future cooperative research.

Finally, the climate change working group and the Internet working group will determine the best way to provide "one-stop shopping" for climate change information in the four departments. A climate change Web site for them should be available by 1998.

METALS IN THE ENVIRONMENT

Objectives: To review metals in the environment (MITE) programs of the four departments and propose priority tasks for cooperative activities on common issues.

Expected Results: The resolution of scientific questions and differences of opinion; development of a federal position, based on good science, to reinforce Canada's policy in national and international fora.

Five important new reports sharpened the focus on the issue of metals in the environment. There was wide reporting on the long-range atmospheric transport and deposition of metals, especially mercury. Work on mercury deposition network sites across Canada continues in 1997, and the mandate has expanded to integrate into the larger industry–university–government NSERC proposal.

1996 Achievements: The work focused on the scientific issues involved in Canada's participation in the United Nations Economic Commission for Europe Heavy Metals Protocol (particularly mercury) under the Convention on Long-Range Transboundary Air Pollution. However, the work also branched out to other policy areas involving heavy metals, including the North American Free Trade Agreement Commission for Environmental Cooperation's (CEC) North American Regional Action Plan for

Mercury; the Great Lakes Water Quality Agreement's virtual elimination strategy, which includes mercury; the national metals policy areas under the Canadian Environmental Protection Act for smelter emissions; environmental effects monitoring for the mining industry; and federal-provincial harmonization of mercury standards.

Two inventories of metals activities in Environment Canada and Fisheries and Oceans Canada were completed. Two reports dealing with the long-range atmospheric transport and deposition of metals, especially mercury, were released. One report contributed to "Continental Pollution Pathways", which was prepared by the Secretariat for the Council of the CEC under Article 13 of the North American Agreement on Environmental Cooperation. Members of the working group also participated in two MITE workshops organized by the Mining Association of Canada (MAC), one concerning smelter emissions and the other on science needs relevant to policy issues.

The various policy and science groups of Environment Canada and Natural Resources Canada that deal with local, regional, and global metals issues relevant to Canada developed a list of the policy and scientific questions that they agreed are critical to policy development and must be addressed by their programs.

A successful joint field program between Environment Canada, Natural Resources Canada, and the University of Guelph developed a new methodology for measuring mercury release to the atmosphere from natural sources.

Next Steps: Inventories of metals activities will be completed, and work will continue on detailed cooperative research programs relevant to outstanding science issues. As a follow-up to the MAC-sponsored MITE workshops, the working group is cooperating with the Canadian Network of Toxicology Centres in developing a proposal for collaboration between industry, university, and government scientists on relevant MITE research.

Work will continue to support expansion of the mercury deposition network sites across Canada. This will provide a better assessment of the spatial and temporal variability of metals in wet deposition. There will also be support for collaborative multi-disciplinary research at calibrated drainage basins in northwestern Ontario and Nova Scotia to assess mercury accumulation and effects on biota such as Canadian loons. Finally, effects studies close to some of Canada's largest base metal smelters will be conducted.

1997 Update: An excellent example of how the MOU expands to integrate programs and meet needs: MITE activities of the four departments are becoming a component of the industry-university-government NSERC (National Science and Engineering

Research Council) MITE proposal. This partnership includes managers and scientists from the minerals industry, along with scientists from the federal government and universities. The research is expected to have a large influence, as it is to focus on the critical federal policy issues and concerns of the mining industry.

An active summer of collaborative field studies is planned, focusing on releases of mercury from natural sources to the atmosphere and geochemical process and biological effects studies in the region around the Horne Smelter, Rouyn-Noranda, Quebec.

Ecosystem Effects of UV-B Radiation

Objectives: To document existing federal research on UV-B impacts and identify and/or create opportunities for interdepartmental collaboration and joint planning to address UV-B impact issues in Canada.

1996 Achievements: A major achievement was the report summarizing current federal impacts research. It concluded that there is a range of research under way in Canada into the effects of present and artificially enhanced levels of UV-B radiation on both natural and managed ecosystems. Research to date shows many disturbing, potential ecosystem effects at present UV-B levels.

- In freshwater ecosystems, UV-B may impact on the carbon cycle, the nitrogen cycle, and the sulfur cycle, affecting necessary nutrients. Combined with other impacts and environmental stressors, this can affect the primary productivity of the freshwater ecosystem.

A disturbing new report shows that there are many potential ecosystem effects at current UV-B levels. It also points to the need for continued research into the ecosystem effects of present and anticipated UV-B levels so that impacts can be minimized. The report also shows that ecosystem effects of UV-B interact with the effects of other atmospheric issues.

- The same impacts can be expected in a marine setting, and research found that more needs to be known about

the UV-B effects on the crustaceans and fish that are important commercially in Canada.
- It was also found that UV-B not only affects crops, but also soil productivity, and that long-term research is needed on UV-B sensitivity in forests.

Continued research is required to identify opportunities to minimize or adapt to these impacts. However, there are a number of areas still requiring attention, and there are few effective coordination methods. The report recommends that the four departments recognize the need for an integrated program and initiate its design and implementation themselves. The key elements include developing a coordinated program and committing resources to it; encouraging NSERC to establish a funding priority related to the ecosystem effects of UV-B radiation and atmospheric change, possibly in the Strategic Grants Program; and ensuring the integration of the resulting Canadian research with other related programs such as the Ecological Monitoring Assessment Network, the Ecosystem Initiatives, the Regional Ecosystem Effects of Atmospheric Change, the Canada Country Study, the Boreal Ecosystem Atmosphere Study, etc.

Other items of focus during the year included the organization of the Colloquium for the 10th Anniversary of the Montreal Protocol; participation in the design of a program to investigate the regional ecosystems effects of atmospheric change, with the aim of providing a sound scientific basis for policy and adaptation strategies; and the publication of the proceedings of the meeting on the ecosystem effects of atmospheric change, held in Pointe-Claire, Quebec.

Next Step: The working group has finished the tasks for which it was originally established. A decision is pending on whether it should continue its work with a renewed mandate.

R&D Priority Setting

The processes used to set R&D priorities within the four departments have been reviewed. Future work includes using a priority setting model to evaluate "public good" research.

Objectives: To identify best practices; to adopt one or more models for R&D priority setting in the four departments, acceptable in whole or in part across natural resources departments; and to incorporate this model into the S&T management process of all four departments on a pilot basis.

Expected Results: Finalization of the inventory of processes for priority setting within the four departments; preparation of an inventory of models for priority setting from other sources; and a comparison of the various models used within the departments.

1996 Achievements: Following the 1995 analysis of the structure and function of R&D in the four departments, 1996 was devoted to analyzing the processes used to set priorities. Other priority-setting vehicles, such as the Australian "feasibility/attractiveness model", were examined.

It was determined that there were enough similarities in methods for priority setting for key features and best practices to be identified and presented to a meeting of the ADM Steering Committee.

Next Steps: The four departments now know each other's priority-setting methods, as well as those of some external organizations. It is clear that no one model will be applicable for all situations, areas of science, or departments, given the different priority-setting requirements in the four departments.

Future work in 1997–98 will include using a representative priority-setting model to evaluate "public good" research. Representatives from Agriculture and Agri-Food Canada and the original working group on climate change will establish a process for using the Program on Energy Research and Development (PERD) climate change projects in the area of greenhouse gas research from the four departments for evaluation. They will use the study management system of Agriculture and Agri-Food Canada.

Coastal Zone Management

Objectives: To document interdepartmental projects and mechanisms, identifying overlaps, gaps and opportunities; to propose areas for improved cooperation and initiatives, including other levels of government and nongovernmental organizations (focusing on the implications of the Oceans Act and the Oceans Management Strategy); and to identify communication initiatives for improving the understanding of sustainable development issues within the scientific and sociological basis of integrated coastal zone management (ICZM).

Expected Results: Meaningful service to the communities represented by scientists working in coastal zone management in Canada.

1996 Achievements: Working definitions and international contexts for the coastal zone have been developed. A computer database has been prepared of ICZM science activities in the four departments. Review of the Marine Environmental Quality Framework and Action Plan resulted in the recommendation that an interdepartmental committee be reconvened to develop these activities.

Following the inventory of ICZM science activities, the data were analyzed for distribution patterns of the activities among the four departments, looking for possibilities of improved cooperation. A number of sites were identified with potential for improved cooperation. The database has other uses that will be available only when it is "cleaned up", and made more "user friendly", ideally in a geographical

Integrated coastal zone management (ICZM) was chosen as one of the initial tasks assigned under the MOU. On January 31, 1997, the Oceans Act was declared. Up to that time, the working group had focused largely on the ICZM research overlaps and gaps among the four departments, but now turns its attention to the coordination and use of science to improve the effectiveness of integrated management activities in coastal environments.

information system (GIS) format. For example, opportunities for sharing facilities and infrastructure may be found from applying overlays of coincident field programs. The working group is considering funding a small contract to achieve this objective.

The possibility has been explored of jointly funding the work of the Atlantic Coastal Zone Information Steering Committee (ACZISC), the group responsible for creating the extensive and comprehensive "Atlantic Coastal Zone Database Directory". This directory is now freely available in searchable format on the Internet, with nearly 1200 pages of information sheets on data sources in Atlantic Canada, including federal, provincial and private holdings. ACZISC has also developed standards for data formats, GIS mapping, and information exchange that could be models for the national ICZM framework being developed under the Oceans Act. It is also responsible for the preparation of the proposed Atlantic accord on ICZM, which may form the regional basis for ICZM under the national framework.

Next Steps: Based on a mandate review, reports on emerging technologies applied to ICZM science, on funding sources, and on the use of traditional ecological knowledge in ICZM are under consideration. The inventory or activities may also be expanded nationally and internationally.

As a new target activity, science priorities, gaps, and needs in ICZM will be identified for planning future efforts, with an orientation toward the use of science in the management aspects of ICZM.

Renewable Energy Technologies

Objective: To integrate the development and deployment of renewable energy (RE) technologies into the sustainable development of natural resources.

Expected Results: Increased collaboration and more joint activities in renewable energy.

1996 Achievements: The working group finalized its inventory of RE activities in the four departments and distributed the report, which shows that there are 26 programs and projects, involving $11.1 million in federal expenditures and $13.9 million from partners. The working group also summarized current mechanisms for coordinating RE activities, identified problems and opportunities, and developed a prioritized list of RE R&D activities to be undertaken by the four departments. RE future trends appear to focus on biomass as the main renewable energy source, pointing to its increased role in meeting industrial energy demands. However, it seems that long-term solutions for reducing carbon intensity point to more use of electricity,

including renewable energy sources (notably small hydro facilities).

The working group decided that consultations could continue with the RE community by linking with the PERD. Based at Natural Resources Canada, PERD is a weli-established interdepartmental program with extensive industry participation and input, providing an effective coordination mechanism for continuing and new RE initiatives. Program Review has reduced its size, and now more than ever it requires increased collaboration among those departments wishing to participate. The working group presented its findings to the ADM Steering Committee after the release of its final report. The report concluded that there were no RE program gaps or overlaps; effective coordination mechanisms among departments were already in place; no major problems were identified; and there was agreement that the work of the group was complete.

Conclusion

Building on tangible results from the first two years, the four natural resources departments have shown the clear advantage of creating partnerships to address science-based issues of the federal government. Quick response to emerging issues is now possible, as shown with the formation of the working group on the environmental effects of endocrine-modulating substances. The working group on valuing natural capital and sustainable development indicators has begun to integrate socioeconomic indicators with science, which helps move forward the sustainable development agenda.

With a vision for the future, the MOU also has a record of achieving results through its working groups. The mechanism is in place for building on a solid foundation of knowledge on issues relating to natural resources, which are key components of our economy. Integrating insights from the health and social sciences into our work on sustainable development, an expanded MOU vision includes working with other departments to help further the goal of sound science that leads to sound policy and decision making.

Annex: Committees and Working Groups

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